US009357680B2

(12) **United States Patent**
Aruga et al.

(10) **Patent No.: US 9,357,680 B2**
(45) **Date of Patent: May 31, 2016**

(54) **METHOD FOR NOTIFYING ABNORMALITY IN ELECTRO DEVICE, AND ELECTRO DEVICE**

(71) Applicant: **Fujitsu Limited**, Kanagawa (JP)

(72) Inventors: **Kazuhiko Aruga**, Kawasaki (JP); **Eisuke Sato**, Kawasaki (JP)

(73) Assignee: **FUJITSU LIMITED**, Kawasaki (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/177,473**

(22) Filed: **Feb. 11, 2014**

(65) **Prior Publication Data**

US 2014/0152446 A1 Jun. 5, 2014

Related U.S. Application Data

(63) Continuation of application No. 13/200,370, filed on Sep. 23, 2011, now Pat. No. 8,687,365, which is a continuation of application No. PCT/JP2009/056688, filed on Mar. 31, 2009.

(51) **Int. Cl.**
H05K 7/20 (2006.01)
G08B 21/18 (2006.01)

(52) **U.S. Cl.**
CPC ***H05K 7/20736*** (2013.01); ***G08B 21/18*** (2013.01); ***H05K 7/20727*** (2013.01); ***H05K 7/20836*** (2013.01)

(58) **Field of Classification Search**
CPC H05K 7/20; H05K 5/00; G06F 1/16; G06F 1/20; H02H 7/08; F01D 1/02
USPC 361/679.46, 679.48, 679.49, 679.5, 361/690–697, 715–724; 165/80.2, 80.3, 165/121–126, 104.33, 185; 454/184; 709/202, 203, 223, 224; 714/39, 46, 714/47, 48, E11, 179, 207; 318/400.21, 318/471, 482, 283, 254.1, 260, 432
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,949,646 A 9/1999 Lee et al.
6,011,689 A 1/2000 Wrycraft
(Continued)

FOREIGN PATENT DOCUMENTS

JP 62-181498 8/1987
JP 408148869 6/1996
(Continued)

OTHER PUBLICATIONS

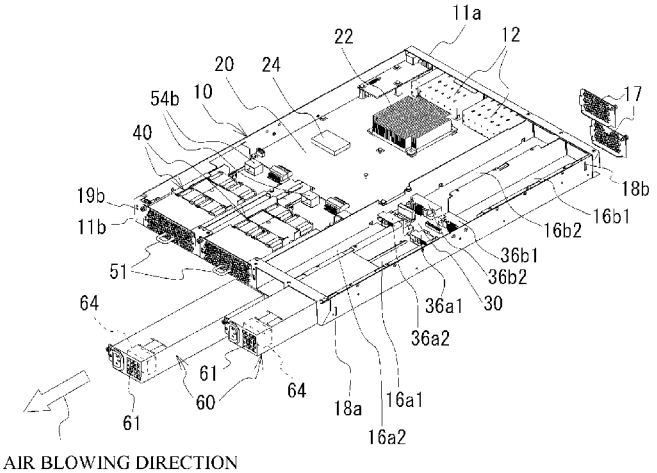
International Search Report mailed on May 26, 2009 in corresponding PCT Application No. PCT/JP2009/056688.
(Continued)

Primary Examiner — Michail V Datskovskiy
(74) *Attorney, Agent, or Firm* — Staas & Halsey LLP

(57) **ABSTRACT**

An electronic device including a fan unit capable of setting an air blowing direction toward any of an interface plate side of a casing and a back plate side opposite to the interface plate; a power supply unit; a first housing portion capable of housing the power supply unit and provided within the casing to be close to the back plate; a second housing portion capable of housing the power supply unit and provided within the casing to be close to the interface plate; a detection portion that detects the air blowing direction of the fan unit and a position where the power supply unit is housed; and a warning portion that operates based on the detection portion to give a warning in a case where the air blowing direction of the fan unit is different from the side where the casing houses the power supply unit.

4 Claims, 8 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

6,054,823	A *	4/2000	Collings et al.	318/400.04
6,225,911	B1 *	5/2001	Nagamasa et al.	340/635
6,354,366	B1 *	3/2002	Naiki	165/80.3
6,532,151	B2	3/2003	Osecky et al.	
6,553,416	B1	4/2003	Chari et al.	
6,563,706	B1 *	5/2003	Strickler	361/695
6,704,196	B1	3/2004	Rodriguez et al.	
6,722,971	B2	4/2004	Gough	
6,735,081	B1	5/2004	Bishop et al.	
6,750,623	B1 *	6/2004	McCauley et al.	318/260
6,816,975	B1 *	11/2004	Sasaki et al.	713/300
7,120,016	B2	10/2006	Suzuki et al.	
7,227,748	B2 *	6/2007	Garnett	361/679.31
7,313,717	B2 *	12/2007	Vecoven et al.	714/4.2
7,434,743	B2 *	10/2008	Barsun et al.	236/49.3
7,492,112	B2 *	2/2009	Huang et al.	318/283
7,572,100	B2 *	8/2009	Strohm	415/213.1
7,675,747	B1 *	3/2010	Ong et al.	361/679.48
7,755,311	B2 *	7/2010	Morishita	318/400.21
7,983,039	B1	7/2011	Nguyen et al.	
8,068,340	B1	11/2011	Nguyen et al.	
8,320,120	B1	11/2012	Chan et al.	
8,385,064	B1 *	2/2013	Smith et al.	361/695
2001/0028551	A1	10/2001	Ota et al.	
2004/0240177	A1	12/2004	Suzuki et al.	
2005/0036287	A2	2/2005	Kosugi	
2005/0055474	A1 *	3/2005	Yang	710/15
2006/0169789	A1 *	8/2006	Barsun et al.	236/49.3
2006/0176663	A1	8/2006	McEwan	
2008/0030954	A1	2/2008	Shieh	
2008/0218949	A1	9/2008	Hughes	

FOREIGN PATENT DOCUMENTS

JP	2001-242963	9/2001
JP	2003-37385	2/2003
JP	2005-5651	1/2005
JP	2005-26266	1/2005
JP	2006-93547	4/2006

OTHER PUBLICATIONS

Office Action mailed Jul. 25, 2013 in corresponding U.S. Appl. No. 13/200,370.

Notice of Allowance mailed Nov. 12, 2013 in corresponding U.S. Appl. No. 13/200,370.

U.S. Appl. No. 13/200,370, filed Sep. 23, 2011, Kazuhiko Aruga, et al., Fujitsu Limited.

* cited by examiner

FIG. 1

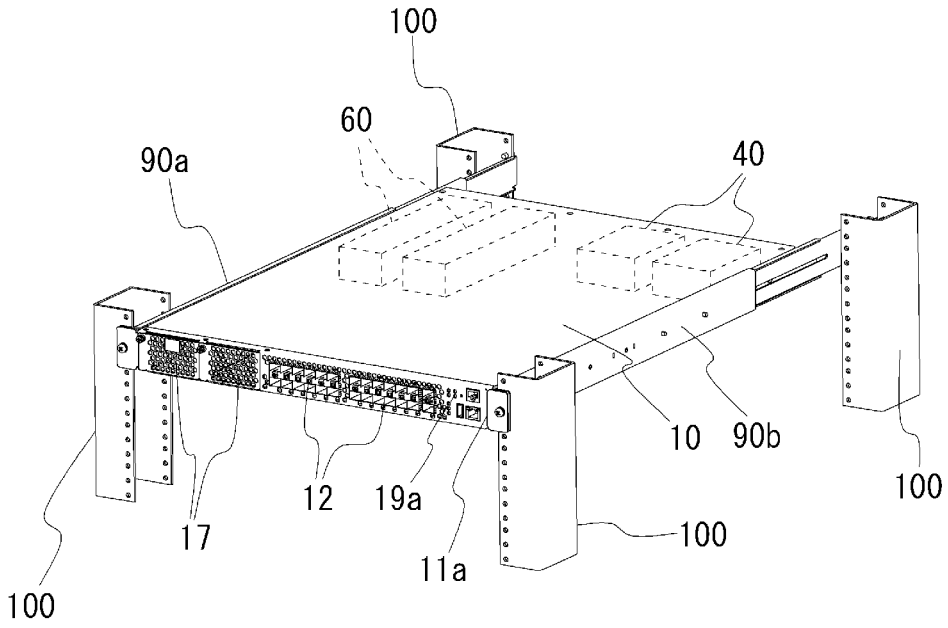


FIG. 2

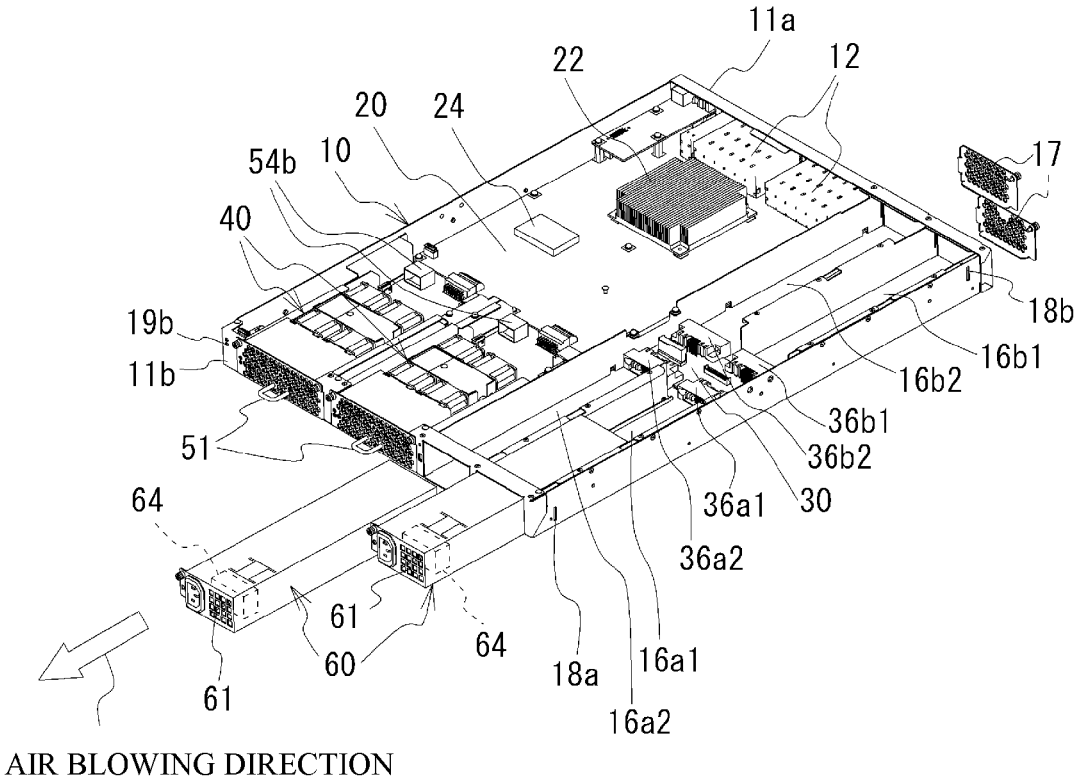

11a
22
12
20
24
54b
10
17
40
18b
19b
16b1
11b
16b2
36b1
51
36b2
64
36a1
30
36a2
61
64
60
18a
16a1
61
16a2
AIR BLOWING DIRECTION

FIG. 3

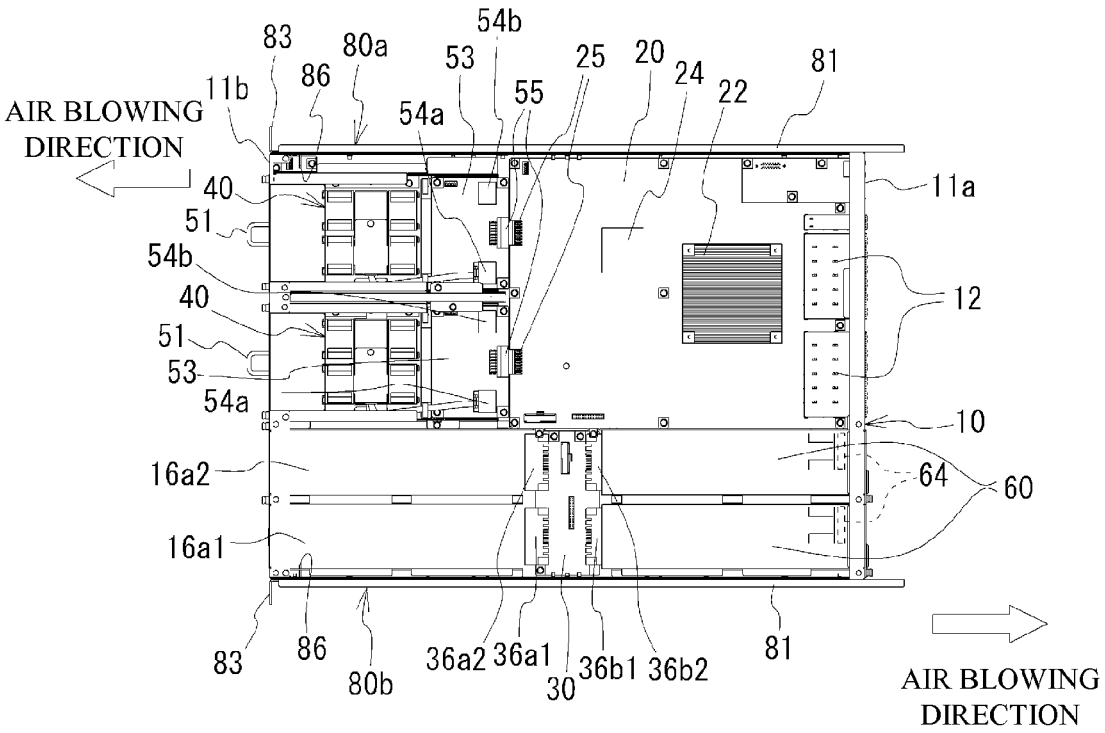

AIR BLOWING DIRECTION
11b
83
86
80a
54b
53
55
25
20
24
22
81
54a
40
51
54b
40
51
53
54a
11a
12
10
64
60
16a2
16a1
83
86
80b
36a2
36a1
30
36b1
36b2
81
AIR BLOWING DIRECTION

FIG. 4A

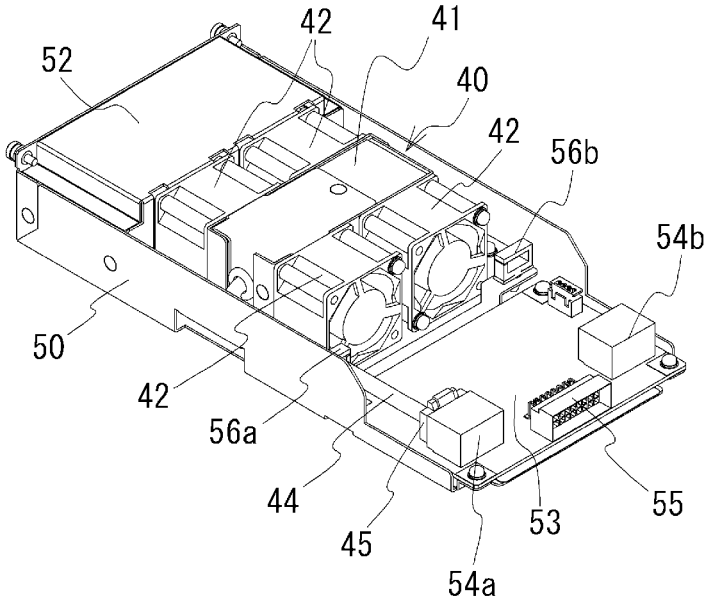

42
41
52
40
42
56b
54b
50
42
56a
44
45
53
55
54a

FIG. 4B

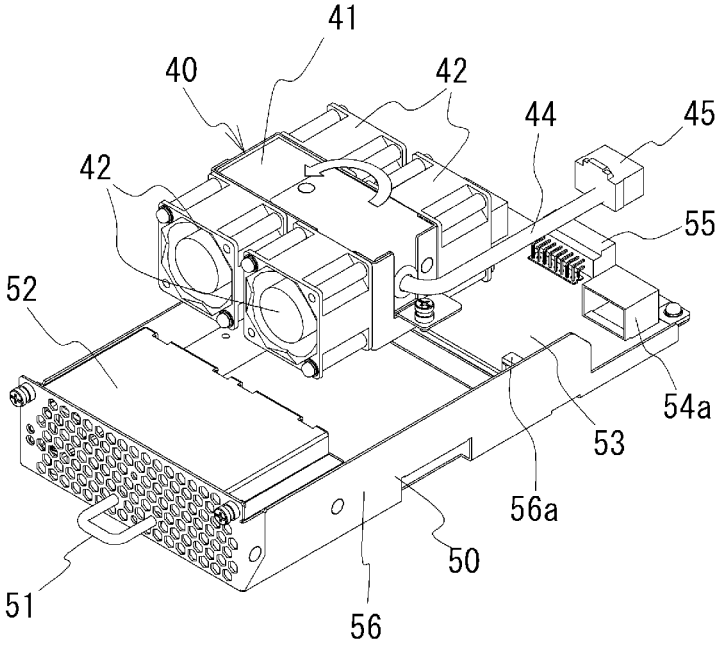

41
40
42
44
45
42
55
52
54a
53
56a
50
51
56

FIG. 5A

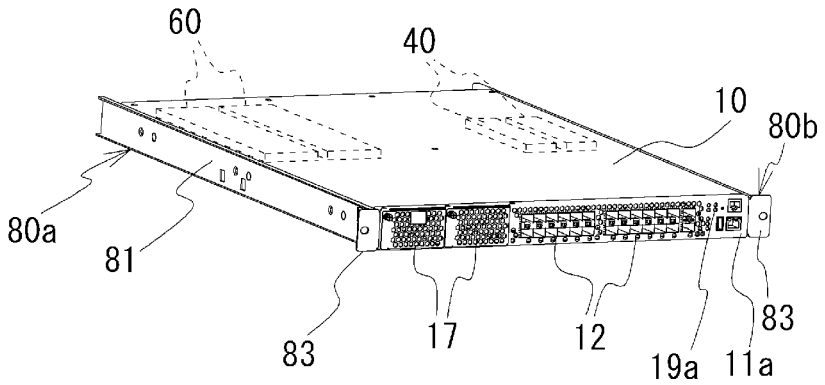
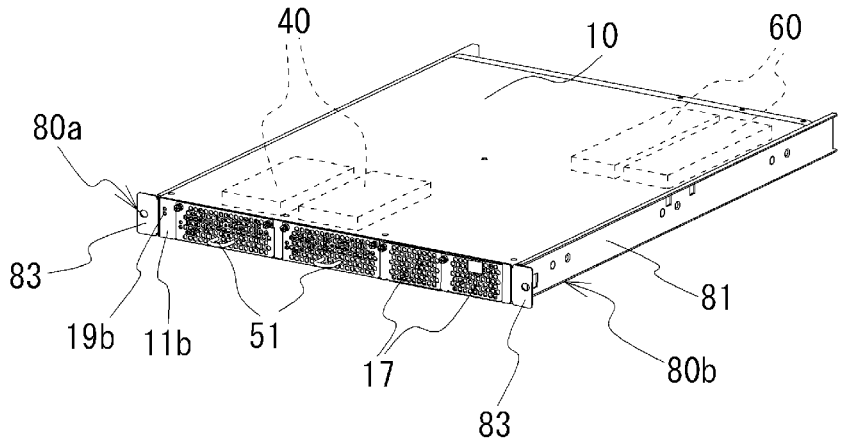

60
40
10
80b
80a
81
83
17
12
19a
11a
83

FIG. 5B


40
10
60
80a
83
19b
11b
51
17
83
81
80b

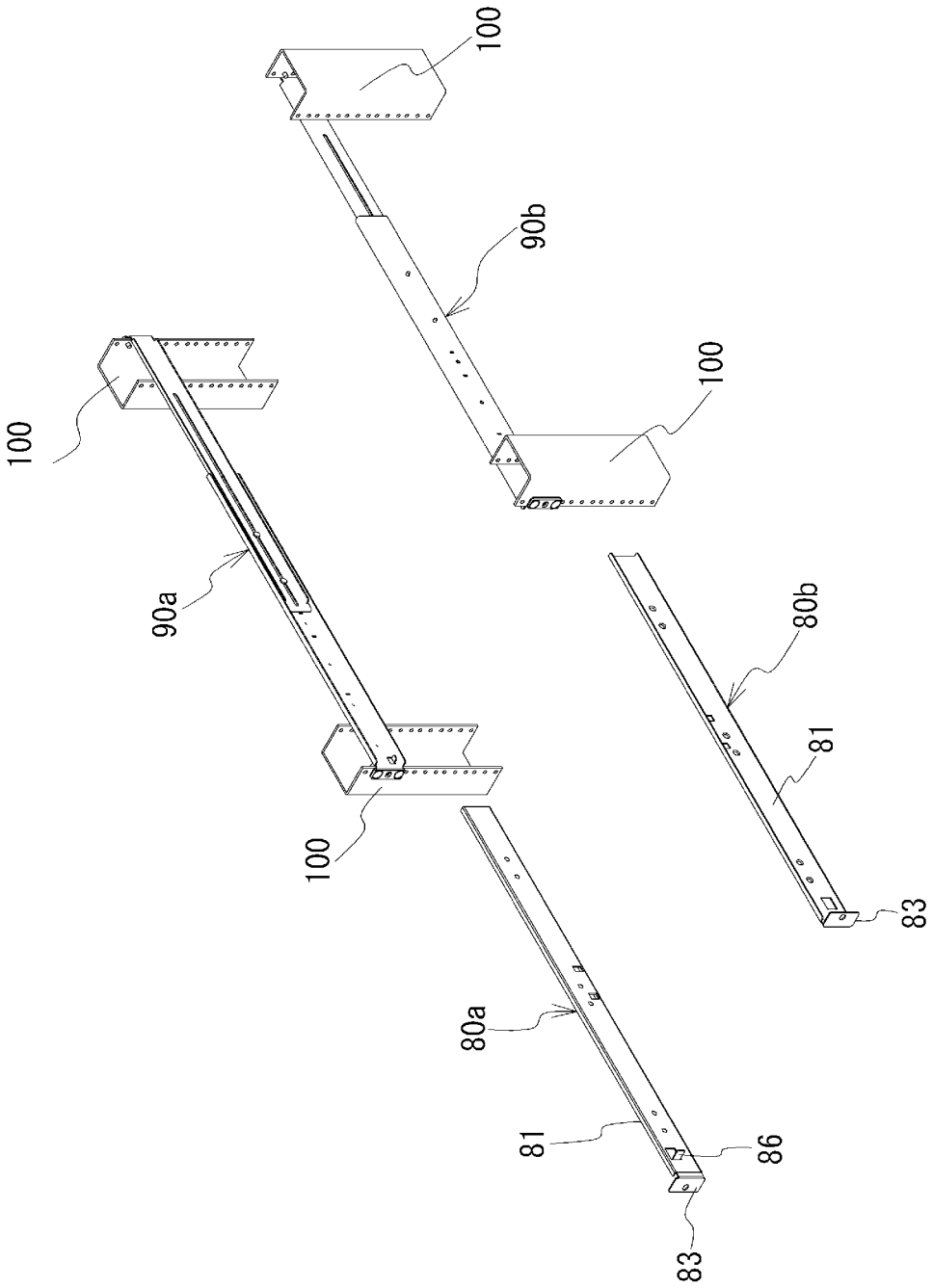


FIG. 6

FIG. 7A

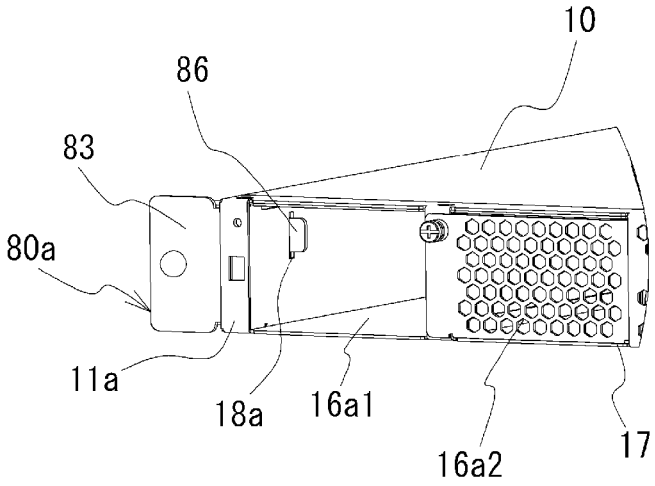

10
86
83
80a
11a
18a
16a1
16a2
17

FIG. 7B

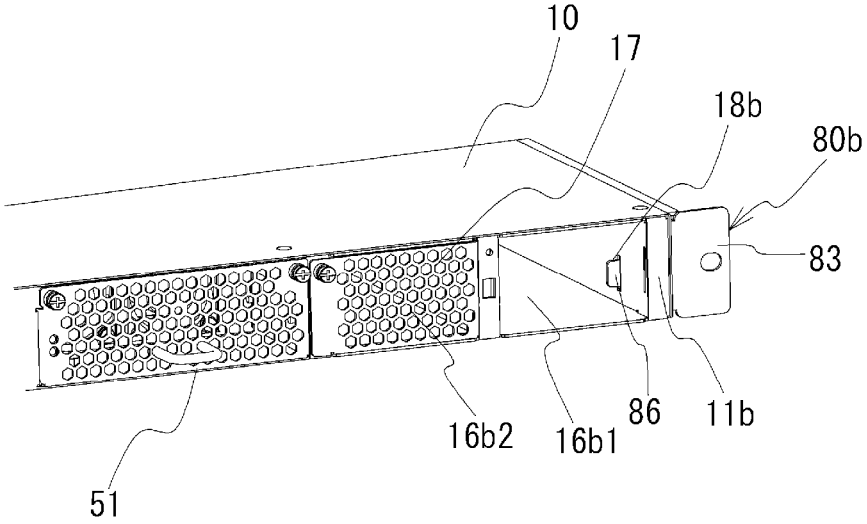

10
17
18b
80b
83
86
11b
16b2
16b1
51

FIG. 8A

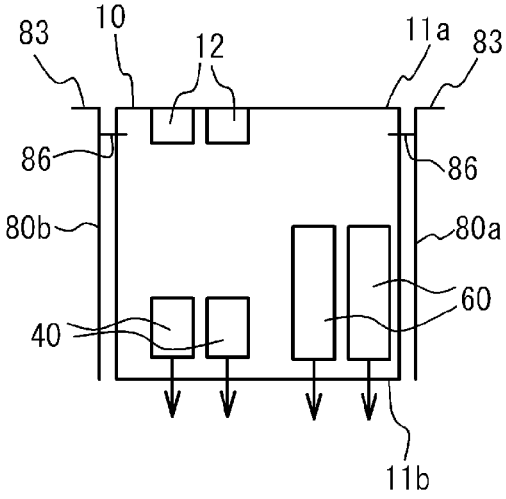


FIG. 8B

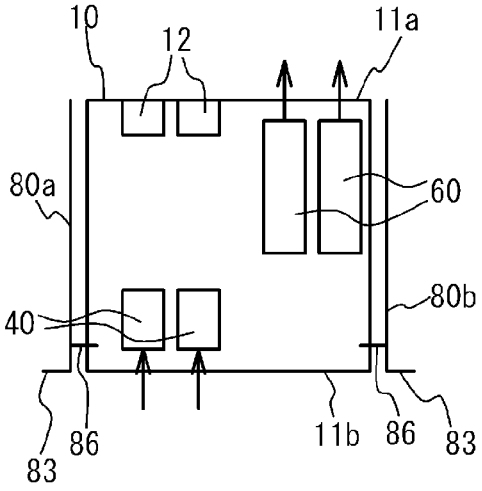


FIG. 8C

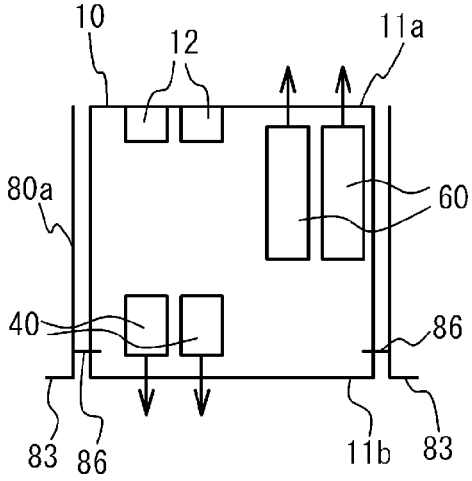
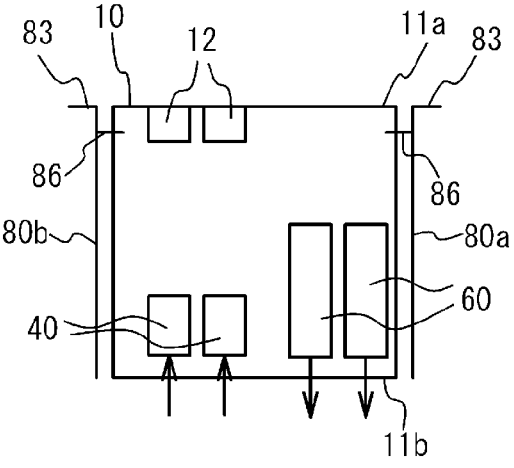


FIG. 8D



METHOD FOR NOTIFYING ABNORMALITY IN ELECTRO DEVICE, AND ELECTRO DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

This application is a divisional of U.S. Ser. No. 13/200,370, filed Sep. 23, 2011, which is a continuation application of PCT/JP2009/056688, filed on Mar. 31, 2009, the entire contents of which are incorporated herein by reference.

FIELD

The embodiments discussed herein are related to an electronic device and a rack system having the same.

BACKGROUND

There is known an electronic device such as a server device, a router device, and a switch device each equipped with a fan unit for cooling therein. Further, there is an electronic device capable of changing an air blowing direction of the fan unit. A technology relevant to such electronic devices is disclosed in Japanese Laid-open Patent Publication No. 2006-93547.

In such electronic devices, there is an electronic device equipped with a power supply unit with a fan. In cases where the posture of the fan unit is changed, an air blowing direction of the fan unit might be different from an air blowing direction of the fan of the power supply unit. In such a case, a cooling efficiency is degraded.

SUMMARY

According to an aspect of the embodiments, an electronic device includes: a fan unit that is capable of setting an air blowing direction toward any of an interface plate side of a casing and a back plate side opposite to the interface plate; a power supply unit; a first housing portion that is capable of housing the power supply unit and is provided within the casing to be close to the back plate; a second housing portion that is capable of housing the power supply unit and is provided within the casing to be close to the interface plate; a detection portion that detects the air blowing direction of the fan unit and a position where the power supply unit is housed; and a warning portion that operates based on the detection portion to give a warning in a case where the air blowing direction of the fan unit is different from the side where the casing houses the power supply unit.

The object and advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the claims.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are not restrictive of the invention, as claimed.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is an explanatory view of a rack system;

FIG. **2** is an explanatory view of an internal structure of an electronic device;

FIG. **3** is an explanatory view of the internal structure of the electronic device;

FIGS. **4**A and **4**B are explanatory views of a fan unit;

FIGS. **5**A and **5**B are explanatory views of a method for securing a casing in a rack;

FIG. **6** is an explanatory view of the method for securing the casing in the rack;

FIGS. **7**A and **7**B are explanatory views of inner rails; and

FIGS. **8**A to **8**D are explanatory views of warning.

DESCRIPTION OF EMBODIMENTS

FIG. **1** is an explanatory view of a rack system. The rack system includes an electronic device and a rack on which the electronic device is mounted.

The electronic device includes a casing **10**. The casing **10** houses fan units **40** and power supply units **60** as will be described later in detail. The rack includes four pillars **100**. Guide rails **90***a* and **90***b* are respectively bridged between a left pair of front and back pillars **100** and a right pair of front and back pillars **100**. The casing **10**, as will be described later in detail, is secured with the pillars **100** by the guide rails **90***a* and **90***b*. Connectors **12** are provided at an interface plate **11***a* of the casing **10**. The connectors **12** are provided for connecting other devices. An LED **19***a* is provided at the interface plate **11***a*.

FIGS. **2** and **3** are explanatory views of an internal structure of an electronic device. Printed circuit boards **20** and **30** are provided within the casing **10**. The printed circuit boards **20** and **30** are electrically connected to each other through a connector or the like. A heat sink **22** and a CPU **24** and the like are mounted on the printed circuit board **20**. Further, in the casing **10**, there is provided with housing portions **16***a***1**, **16***a***2**, **16***b***1**, and **16***b***2** for housing two power supply units **60**. The housing portions **16***a***1** and **16***a***2** are provided for inserting the power supply unit **60** thereinto, when the casing **10** is secured in the rack such that the interface plate **11***a* faces a front side of the rack. The housing portions **16***a***1** and **16***a***2** are provided relatively close to a back plate **11***b*. Further, the housing portions **16***b***1** and **16***b***2** are provided for inserting the power supply unit **60** thereinto, when the casing **10** is secured in the rack such that the back plate **11***b* opposite to the interface plate **11***a* faces the front side of the rack. The housing portions **16***b***1** and **16***b***2** are provided relatively close to the interface plate **11***a*. Therefore, even when the casing **10** is secured in the rack such that any of the interface plate **11***a* and the back plate **11***b* facing the front side of the rack, the power supply unit **60** that dissipates heat is positioned at a back side of the rack, and then air is exhausted to the back side of the rack. The housing portions **16***a***1** and **16***b***1** are communicated to each other, and the housing portions **16***a***2** and **16***b***2** are also communicated to each other. Further, the housing portions **16***a***1**, **16***a***2**, **16***b***1**, and **16***b***2** each have a duct shape. The power supply unit **60** is insertable into and removable from the housing portions **16***a***1**, **16***a***2**, **16***b***1**, and **16***b***2**. The housing portions **16***a***1** and **16***b***1** are arranged in line along a side wall of the casing **10**. The housing portions **16***a***2** and **16***b***2** are arranged close to the inside as compared with the housing portions **16***a***1** and **16***b***1**. Additionally, FIG. **2** illustrates a state while the power supply units **60** are being removed from the housing portions **16***a***1** and **16***a***2** respectively.

The power supply unit **60**A houses a fan **64**. The power supply unit **60** is provided at its one end with an air blowing opening **61** for exhausting air blown from the fan **64**. The fan **64** exhausts air toward the outside of the power supply unit **60**. Further, the power supply unit **60** is provided at its other end with a connector. When the power supply unit **60** is inserted into the housing portion **16***a***1**, **16***a***2**, **16***b***1**, or **16***b***2**, it is inserted from the other end of the power supply unit **60**. Therefore, the power supply unit **60** housed in the housing

portions **16***a***1** or **16***a***2** is different in the air blowing direction from the power supply unit **60** housed in the housing portion **16***b***1** or **16***b***2**. In such a way, the housing portions **16***a***1** and **16***a***2** house the power supply units **60** in such postures that the air blowing directions are first directions relative to the casing **10** (the direction toward the back plate **11***b*). Further, the housing portions **16***b***1** and **16***b***2** house the power supply units **60** in such postures that the air blowing directions are second directions relative to the casing **10** (the direction toward the interface plate **11***a*). That is, as mentioned above, air is exhausted from the casing **10**, in particular, always from the side of the power supply unit **60**. This permits the heat of the power supply unit **60** itself not to be stayed within the casing **10**.

The printed circuit board **30** is arranged between the housing portions **16***a***1** and **16***a***2** and the housing portions **16***b***1** and **16***b***2**. Connectors **36***a***1**, **36***a***2**, **36***b***1**, and **36***b***2** are mounted on the printed circuit board **30**. The connectors **36***a***1** and **36***a***2** are an example of a first connector for a power supply unit. The connectors **36***b***1** and **36***b***2** are an example of a second connector for a power supply unit. The connector **36***a***1** is connected to a connector of the power supply unit **60** housed in the housing portion **16***a***1**. The other connectors **36***a***2**, **36***b***1**, and **36***b***2** also have the same arrangements.

Further, two fan units **40** are housed within the casing **10**. The fan unit **40** is housed at the back plate **11***b* side. The back plate **11***b* is opposite to the interface plate **11***a*. The fan unit **40** is capable of reversing its posture relative to the casing **10**, thereby reversing the air blowing direction of the fan unit **40**. Additionally, in the state illustrated in FIG. **2**, the fan unit **40** and the power supply unit **60** are the same in the air blowing direction with each other, and air is exhausted from the positions of the power supply units **60** tending to have high-temperature heat, thereby preventing the air from being stayed within the casing **10**.

Cases where the air blowing direction is reversed will be described. Firstly, the power supply units **60** are removed from the housing portions **16***a***1** and **16***a***2** as illustrated in FIG. **2**. Next, the power supply units **60** are respectively inserted into the housing portions **16***b***1** and **16***b***2** as illustrated in FIG. **3**. Additionally, at this time, the power supply unit **60** is inserted such that the air blowing opening **61** is arranged at the interface plate **11***a* side. In the state illustrated in FIG. **3**, the fan unit **40** is different in the air blowing direction from the power supply unit **60**. Next, the postures of the fan units **40** are reversed.

FIGS. **4**A and **4**B are explanatory views of the fan unit. The fan unit **40** is secured on a holding board **50**. The holding board **50** is provided with a handle **51**. The holding board **50** is insertable into and removable from the casing **10**. The holding board **50** is removed from the casing **10** by pulling the handle **51**. The fan unit **40** is secured on the holding board **50** by screws. The screws are removed, and the fan unit **40** is secured on the holding board **50** with the fan unit **40** being in a reverse posture.

The fan unit **40** includes: a tube portion **41**; four fans **42**; and a cable **44** provided in the tube portion **41**. The tube portion **41** is formed with an air passage therewithin. The cable **44** ensures power supply. The cable **44** is provided at its one end with a connector **45**. Each of the fans **42** is rotated in one direction by an actuator. Further, the holding board **50***a* holds a duct portion **52** and a printed circuit board **53**. The duct portion **52** functions as a passage for blowing air. Connectors **54***a* and **54***b* are respectively mounted at the left and right sides of the printed circuit board **53**. The connectors **54***a* and **54***b* are an example of a connector for a fan unit. A connector **55** is mounted at an edge of the printed circuit board **53**. The length of the cable **44** is set to be alternatively connected to the connectors **54***a* and **54***b* based on the posture of the fan unit **40**. That is, in the state illustrated in FIG. **4**, the length of the cable **44** is set to be connectable to the connector **54***a*, but not to be connectable to the connector **54***b*.

The connectors **54***a* and **54***b* are electrically connected to the connector **55** through patterns on the printed circuit board **53**. The connector **55** is connected to a connector **25** mounted on the printed circuit board **20**. Additionally, as illustrated in FIG. **4**, the holding board **50** is provided with holding members **56***a* and **56***b* for holding the cable **44**. The holding members **56***a* and **56***b* are each made of a synthetic resin with elasticity. The holding members **56***a* and **56***b* each have a ring shape partially provided with a cutout. The holding members **56***a* and **56***b* are opened to hold the cable **44**.

As illustrated in FIG. **4**B, the fan unit **40** is removed from the holding board **50**, and then the posture of the fan unit **40** is reversed. The fan unit **40** is secured on the holding board **50** again, and then the connector **45** of the cable **44** is inserted into the connector **54***b*. Next, the holding board **50** is inserted into the casing **10**, whereby the connectors **55** and **25** are connected to each other. Therefore, the fan unit **40** and the printed circuit board **20** are electrically connected to each other. In such a manner, the air blowing direction of the fan unit **40** is reversed. Accordingly, the holding board **50** can hold the fan unit **40** in such a posture that the air blows in any of the first and second directions.

A description will be given of a change in the air blowing direction in the above manner. Plural electronic devices are mounted in the above mentioned rack. The plural electronic devices are connected to each other through cables. The electronic device has an interface plate provided with connectors to which the cables are connected. Generally, a server type device is designed to be secured in the rack such that its interface plate faces the back side of the rack, and a network type device such as a router and a switch is designed to be secured in the rack such that its interface plate faces the front side of the rack. Thus, in plural devices mounted in the same rack, the interface plates might not be arranged at the same side in many cases. Any devices are designed to exhaust air toward the back side of the rack. Thus, when the devices are secured in the rack, the air blowing directions of the devices are the same with each other. However, the interface plates of the devices are not arranged at the same side. Therefore, the cable for connecting both devices to each other has to be passed between both devices. For this reason, it is necessary to provide a space, in which the cable passes, between both devices arranged up and down and secured in the rack.

Further, when the plural devices are secured in the rack such that the interface plates thereof are arranged at the same side, the air blowing directions of the plural devices are not the same with each other. Thus, blowing air might interfere with each other to degrade the cooling efficiency of the whole rack.

However, as to the electronic device according to the present embodiment, the air blowing direction is changed for every device, thereby making the air blowing directions same with each other and preventing the cooling efficiency of the whole rack from being degraded even when the plural devices are secured in the rack such that the interface plates thereof are arranged at the same side. Moreover, the interface plates are arranged at the same side, thereby reducing the space between the plural devices. This can reduce space.

Next, a method for securing the casing **10** in the rack will be described. FIGS. **5**A, **5**B, and **6** are explanatory views of the method for securing the casing **10** in the rack. FIG. **5**A is an explanatory view of cases where the casing **10** as a network

type device is secured in the rack such that the interface plate **11***a* faces the front side of the rack. Inner rails **80***a* and **80***b* are respectively secured at the side surfaces of the casing **10** such that securing pieces **83** are arranged at the interface plate **11***a* side. The inner rails **80***a* and **80***b* are secured in the rack by the screws. The inner rail **80***a* includes: a base portion **81** with a thin plate shape; the securing piece **83** positioned at one end of the base portion **81**; and a projection piece **86** as will be described later. The other end of the base portion **81** is not provided with the securing piece **83**. The securing piece **83** is perpendicular to the base portion **81**. The securing piece **83** is provided with a hole through which the screw penetrates, the screw securing the securing piece **83** in the front pillar **100** of the rack.

FIG. **5** is an explanatory view of cases where the casing **10** as a network type device is secured in the rack such that the back plate **11***b* faces the front side of the rack. In cases where the casing **10** is secured in the rack such that the back plate **11***b* faces the front side of the rack, the inner rails **80***a* and **80***b* in the above case are replaced with each other and then secured on the opposite surfaces of the casing **10** in such postures that the securing piece **83** are positioned at the back plate **11***b* side. Additionally, cover plates **17** are provided for respectively covering the housing portions **16***a***1**, **16***a***2**, **16***b***1**, and **16***b***2**, and removable from the casing **10**. The cover plate **17** is provided with plural holes for ensuring air flow.

As illustrated in FIG. **6**, the guide rails **90***a* and **90***b* are connected to two pillars **100**. The guide rails **90***a* and **90***b* support the inner rails **80***a* and **80***b* for sliding, respectively. When the electronic device is mounted in the rack, the guide rails **90***a* and **90***b* are engaged with the base portions of the inner rails **80***a* and **80***b*, respectively. Next, as illustrated in FIG. **6**, the casing **10** is pushed and slid relative to the guide rails **90***a* and **90***b*, and then the securing pieces **83** of the inner rails **80***a* and **80***b* are secured in the pillars **100** respectively. The securing piece **83** is secured in the pillar **100** by a screw. Additionally, the casing **10** is omitted in FIG. **6**.

Next, the inner rails **80***a* and **80***b* will be described in detail. FIG. **7**A is an explanatory view of the inner rail **80***a* in cases where the casing **10** is secured in the rack such that the interface plate **11***a* faces the front side of the rack. The inner rail **80***a* is provided with the projection piece **86** at an inner side of the base portion **81**. Further, the casing **10** is provided at its side surface facing the base portion **81** with a hole **18***a* through which the projection piece **86** penetrates. When the inner rail **80***a* is secured to the casing **10**, the projection piece **86** projects into the housing portion **16***a***1** through the hole **18***a*. In other words, the projection piece **86** is inserted into the housing portion **16***a***1**, which is closer to the securing piece **83**, selected from the housing portion **16***a***1** or **16***b***1**. Therefore, when being tried to be inserted into the housing portion **16***a***1**, the power supply unit **60** interferes with the projection piece **86** projecting into the housing portion **16***a***1**. Thus, the power supply unit **60** cannot be inserted into the housing portion **16***a***1**. Further, in the state where the power supply unit **60** is inserted into the housing portion **16***a***1**, the inner rail **80***a* cannot be attached such that the securing piece **83** of the inner rail **80***a* is arranged at the interface plate **11***a* side.

FIG. **7**B is an explanatory view of the inner rail **80***b* in cases where the casing **10** is secured in the rack such that the back plate **11***b* faces the front side of the rack. The projection piece **86** of the inner rail **80***b* also projects into the housing portion **16***b***1**, which is closer to the securing piece **83** of the inner rail **80***b*, selected from the housing portion **16***a***1** or **16***b***1**. Therefore, the power supply unit **60** cannot be inserted into the housing portion **16***b***1**. Further, in the state where the power supply unit **60** is inserted into the housing portion **16***b***1**, the inner rail **80***b* cannot be attached such that the securing piece **83** of the inner rail **80***b* is arranged at the back plate **11***b* side.

As mentioned above, the power supply unit **60** cannot be housed at the front side of the rack. This reason is as follows. When the power supply unit **60** is housed at the front side of the rack, air is blown from the front side of the electronic device toward the outside thereof by the fan **64** of the power supply unit **60**. Thus, air is blown toward the front side of the rack. Thus, the air blowing directions of this device and that of another device interfere with each other. However, in the electronic device according to the present embodiment, such a situation is avoided by the projection pieces **86** of the inner rails **80***a* and **80***b*.

Additionally, the casing **10** is also provided at its side surfaces opposite to the surfaces of the housing portions **16***a***1** and **16***b***1** side with holes for escaping the projection pieces of the inner rail.

Next, warning by use of LEDs **19***a* and **19***b* will be described. The LEDs **19***a* and **19***b* are examples of warning portions. The LED **19***a* is provided at the interface plate **11***a* side of the casing **10**. The LED **19***b* is provided at the back plate **11***b* side of the casing **10**. The LEDs **19***a* and **19***b* are lighted with power supply from the printed circuit board **20**. The CPU **24** detects the postures of the fan units **40** and the power supply units **60**. The CPU **24** detects the posture of the fan unit **40** based on whether or not the connector **45** of the fan unit **40** is connected to the connector **54***a* or **54***b*. The CPU **24** detects the posture of the power supply units **60** based on whether or not the power supply unit **60** is connected to the connector **36***a***1** or **36***a***2** or the connector **36***b***1** or **36***b***2**.

When the detection result indicates that the fan unit **40** is different in the air blowing direction from the power supply unit **60**, the CPU **24** controls the LEDs **19***a* and **19***b* to flash. Therefore, an operator can recognize that the fan unit **40** is different in the air blowing direction from the power supply unit **60**. When the detection result indicates that the air blowing directions are the same with each other, the CPU **24** keeps the LEDs **19***a* and **19***b* off.

The cases where the air blowing directions are different from each other are, for example, cases where the connector **45** of the fan unit **40** is connected to the connector **54***a* and the connectors of the power supply units **60** are respectively connected to the connectors **36***b***1** and **36***b***2**. For example, this is the state illustrated in FIG. **3**. Further, they are cases where the connector **45** is connected to the connector **54***b* and the power supply units **60** are respectively connected to the connectors **36***a***1** and **36***a***2**. The cases where the air blowing directions are the same with each other are, for example, cases where the connector **45** of the fan unit **40** is connected to the connector **54***a* and the power supply units **60** are respectively connected to the connectors **36***a***1** and **36***a***2**. Further, they are cases where the connector **45** of the fan unit **40** is connected to the connector **54***b* and the power supply units **60** are respectively connected to the connectors **36***b***1** and **36***b***2**.

FIGS. **8**A to **8**D are explanatory views of cases where the warning is performed and cases where the warning is not given. Since the fan units **40** are the same in the air blowing direction with the power supply units **60** as illustrated in FIGS. **8**A and **8**B, the warning is not given. Since the fan units **40** are different in the air blowing direction from the power supply units **60** as illustrated in FIGS. **8**C and **8**D, the warning is given. That is, the CPU **24** controls the LEDs **19***a* and **19***b* to flash.

In such a way, the lighting pattern of the LEDs **19***a* and **19***b* are changed to give a warning to the operator. Additionally, not only in a case as illustrated in FIGS. **8**C and **8**D, but also a case where the CPU **24** may control the LEDs **19***a* and **19***b*

to flash when one of two power supply units is inserted into the housing portion **16***a***1** or **16***a***2** and the other is inserted into the housing portion **16***b***1** or **16***b***2**.

In the present embodiment, the change in the lighting pattern of the LEDs **19***a* and **19***b* gives to a warning to a user. The present invention is not limited to these arrangements. For example, a warning may be sounded to a user.

All examples and conditional language recited herein are intended for pedagogical purposes to aid the reader in understanding the invention and the concepts contributed by the inventor to furthering the art, and are to be constructed as being without limitation to such specifically recited examples and conditions, nor does the organization of such examples in the specification relate to a showing of the superiority and inferiority of the invention. Although the embodiment of the present inventions has been described in detail, it should be understood that the various changes, substitutions, and alterations could be made hereto without departing from the sprit and scope of the invention.

What is claimed is:

1. A method for notifying abnormality in an electronic device comprising a casing and a fan unit installed in the casing, wherein

in a case where a power supply unit that exhausts air through a first surface side of the casing is inserted into the casing from the first surface side through which the fan unit draws or exhausts air based on an air blowing direction that is set in the fan unit,

the method comprising changing a combination of lighting states of LEDs attached to the first surface side and a back surface side, of the casing, opposite to the first surface side based on whether the air blowing direction is set so as to draw or exhaust air.

2. The method of claim **1**, wherein the changing changes the combination such that the lightning states of one of the LEDs attached to the first surface side and another one of the LEDs attached to the back surface side indicate an abnormal state where the air blowing direction is set in the fan unit so as to draw air through the first surface side of the casing.

3. An electronic device, comprising:

a casing which has a first surface and a second surface;

a fan unit which is installed in the casing and one of draws and exhausts air through the first surface of the casing based on an air blowing direction that is set in the fan unit;

a power supply unit which is installed in the casing and exhausts air through the first surface of the casing;

a first LED which is attached to the first surface of the casing; and

a second LED which is attached to the second surface of the casing,

wherein a combination of lightning state of the first LED and the second LED is changed to a different state based on whether the air blowing direction is set so as to draw or exhaust air.

4. The electronic device of claim **3**, wherein the combination of lightning state of the first LED and the second LED indicates an abnormal state in the case where the air blowing direction is set so as to draw air from the power supply unit.

* * * * *